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(54) **METHOD, SYSTEM AND APPARATUS FOR SELECTING AN IMAGE CAPTURED ON AN IMAGE CAPTURE DEVICE**

(71) Applicant: **CANON KABUSHIKI KAISHA**, Tokyo (JP)

(72) Inventors: **Alex Penev**, New South Wales (AU); **Mark Ronald Tainsh**, New South Wales (AU)

(73) Assignee: **Canon Kabushiki Kaisha**, Tokyo (JP)

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(51) **Int. Cl.**

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H04N 5/232	(2006.01)
H04N 1/00	(2006.01)
H04N 101/00	(2006.01)

(52) **U.S. Cl.**

CPC ***H04N 5/23293*** (2013.01); ***H04N 1/0044*** (2013.01); ***H04N 5/23206*** (2013.01); *H04N 2101/00* (2013.01)

(58) **Field of Classification Search**

USPC 348/333.11, 231.2, 207.11; 382/100

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,164,992	A	11/1992	Turk et al.	
6,184,926	B1	2/2001	Khosravi et al.	
7,620,720	B1	11/2009	Gasser	
7,711,145	B2	5/2010	Gallagher	
2004/0126038	A1	7/2004	Aublant	
2005/0096084	A1*	5/2005	Pohja et al.	455/556.1
2008/0317298	A1*	12/2008	Shah et al.	382/118
2010/0086204	A1	4/2010	Lessing	
2010/0287053	A1	11/2010	Ganong et al.	
2010/0328492	A1*	12/2010	Fedorovskaya et al.	348/231.2

(Continued)

FOREIGN PATENT DOCUMENTS

CN	101918989	A	12/2010
JP	2007181070	A	7/2007

(Continued)

OTHER PUBLICATIONS

"Making Photo Tagging Easier"; Justin Mitchell; Jun. 30, 2011.

"Some Results on Multicategory Patter Recognition"; Bledsoe, Panoramic Research, Inc., Palo Alto, California; p. 304-316.

Primary Examiner — Roberto Velez

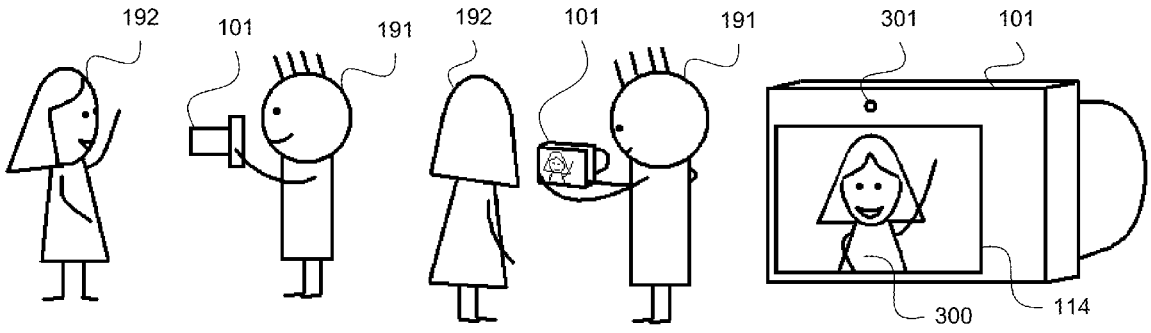
Assistant Examiner — Stephen Coleman

(74) *Attorney, Agent, or Firm* — Canon U.S.A., Inc. IP Division

(57) **ABSTRACT**

A method of selecting an image captured on an image capture device (**101**) is disclosed. A captured image is displayed on a display (**114**) associated with the image capture device (**101**). A viewer image of a viewer viewing the captured image displayed on the display (**114**) is captured using the image capture device (**101**). The captured image and the viewer image are compared to identify at least one common feature in the captured image and the viewer image. The captured image is selected if the at least one common feature is identified in both the captured image and the viewer image.

29 Claims, 10 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2011/0050954	A1	3/2011	Prentice	
2011/0096149	A1*	4/2011	Au et al.	348/47
2012/0054311	A1*	3/2012	Mizuno et al.	709/218
2012/0170847	A1*	7/2012	Tsukidate	382/190

FOREIGN PATENT DOCUMENTS

JP	2010-169954	A	8/2010
JP	2011-090158	A	5/2011
WO	WO2010/038112	A1	4/2010
WO	WO2011/028231	A1	3/2011

* cited by examiner

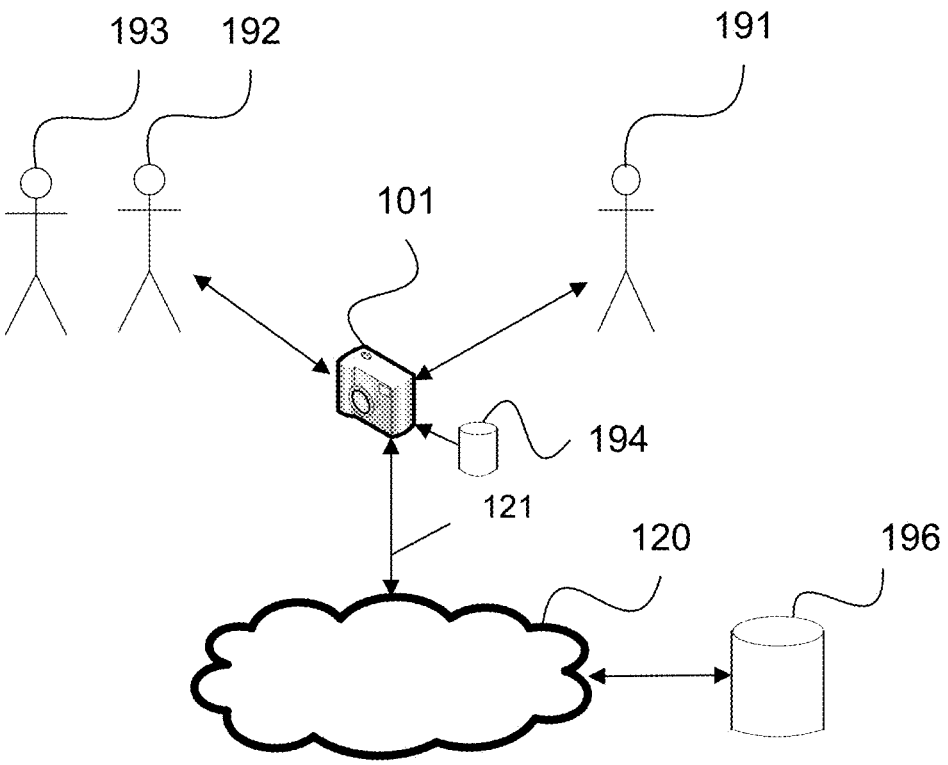


Fig. 1A

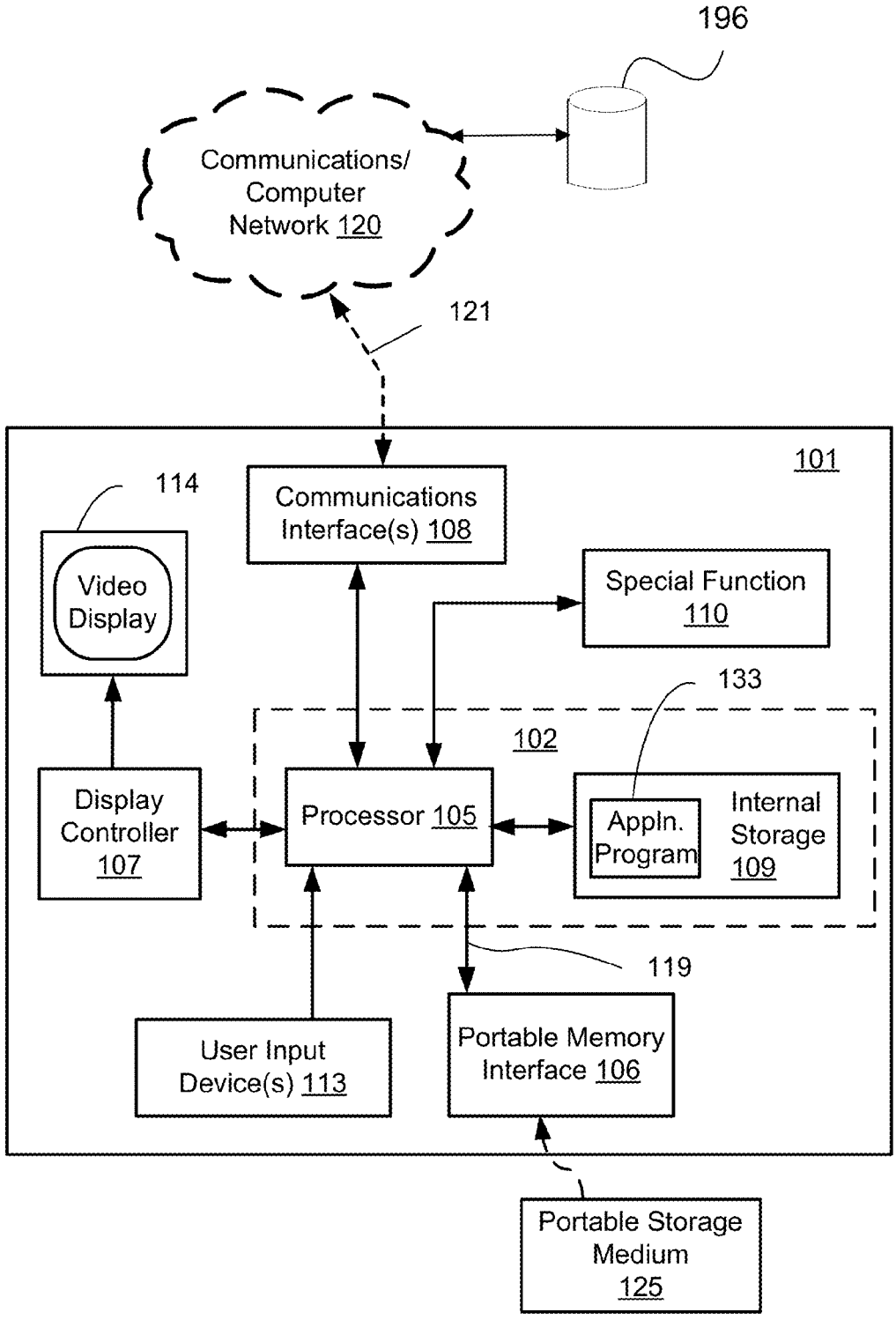

196
Communications/
Computer
Network 120
121
101
114
Communications
Interface(s) 108
Video
Display
Special Function
110
133
102
Display
Controller
107
Processor 105
Appln.
Program
Internal
Storage
109
119
User Input
Device(s) 113
Portable Memory
Interface 106
Portable Storage
Medium
125

Fig. 1B

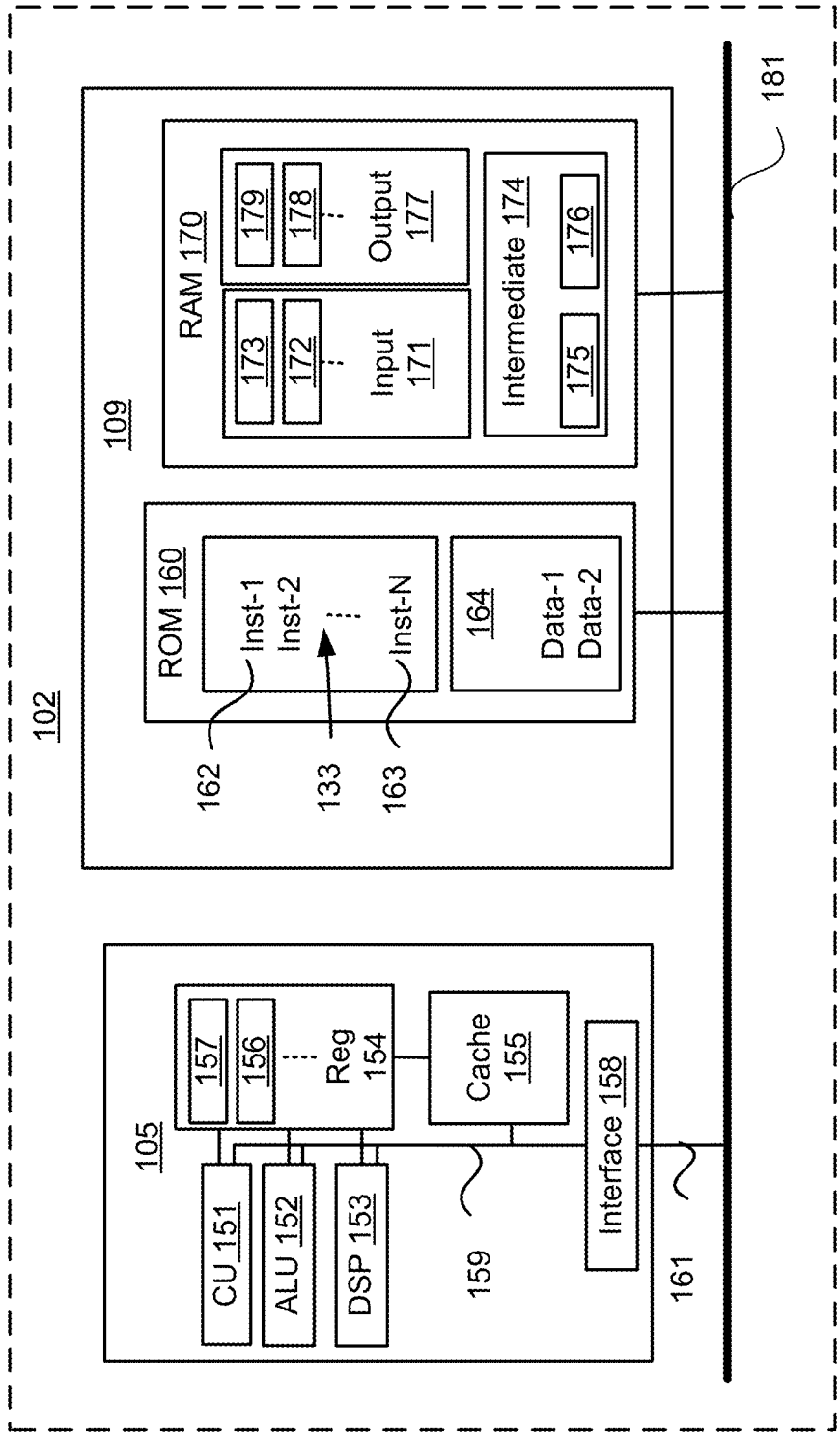

102
109
RAM 170
179
178
Output 177
173
172
Input 171
Intermediate 174
176
175
ROM 160
Inst-1
Inst-2
Inst-N
164
Data-1
Data-2
162
133
163
181
105
157
156
Reg 154
Cache 155
CU 151
ALU 152
DSP 153
Interface 158
159
161

Fig. 1C

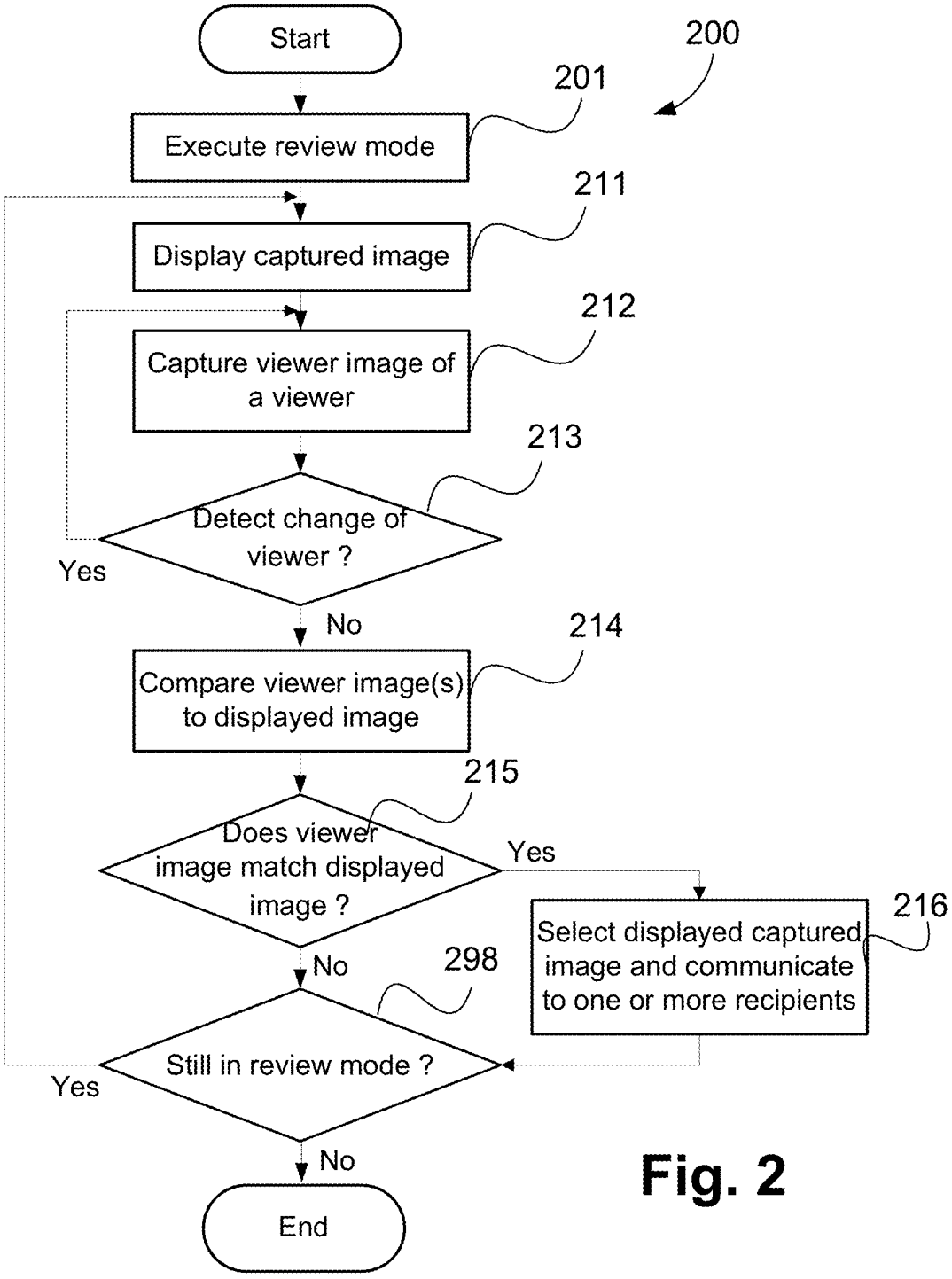

Start
200
201
Execute review mode
211
Display captured image
212
Capture viewer image of a viewer
213
Detect change of viewer ?
Yes
No
214
Compare viewer image(s) to displayed image
215
Does viewer image match displayed image ?
Yes
216
Select displayed captured image and communicate to one or more recipients
No
298
Still in review mode ?
Yes
No
End

Fig. 2

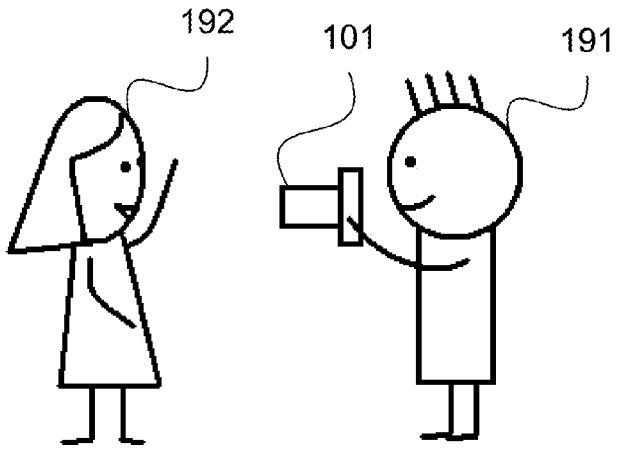


Fig. 3A

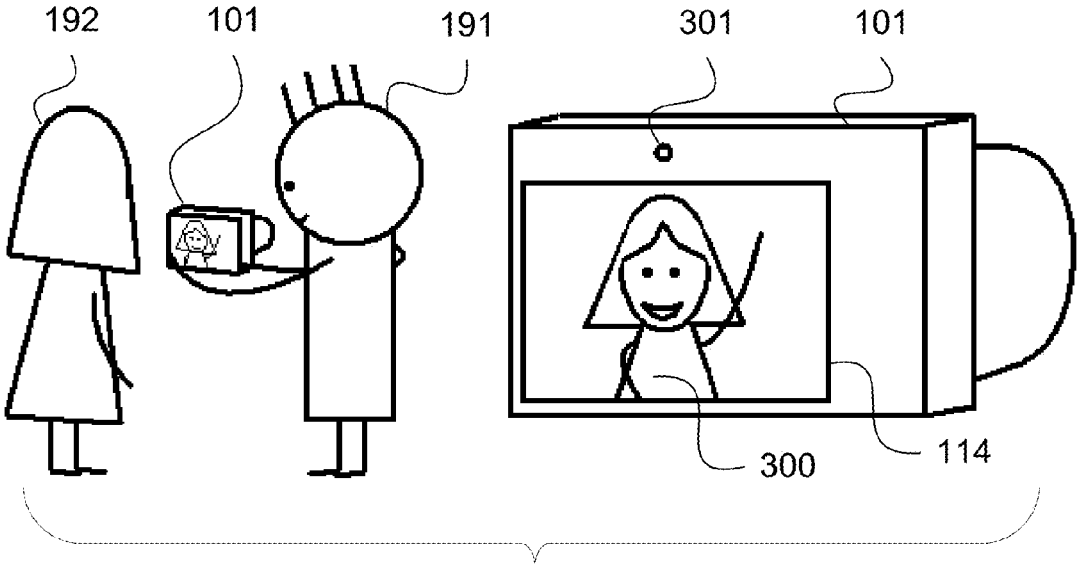


Fig. 3B

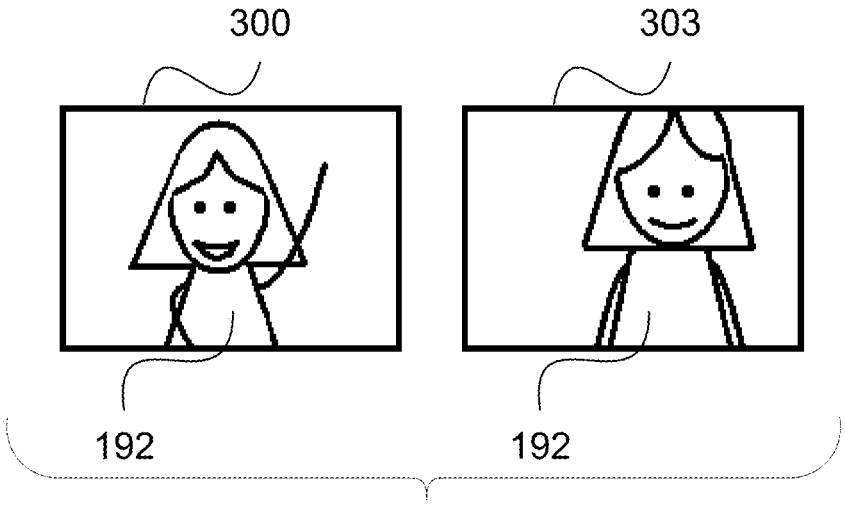


Fig. 3C

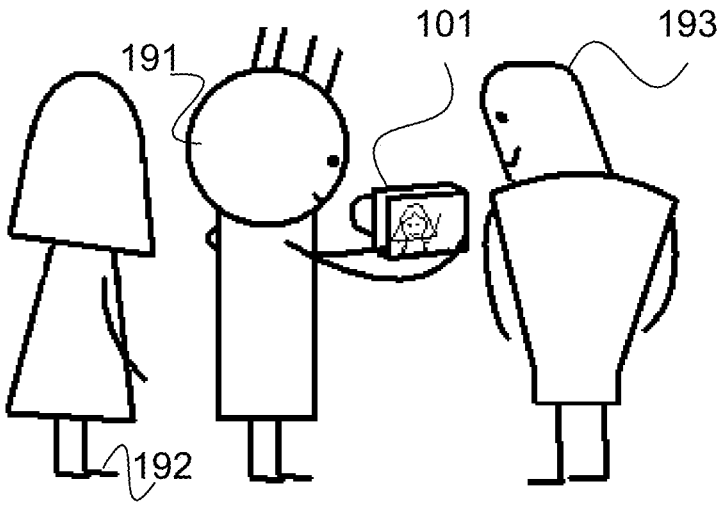


Fig. 4A

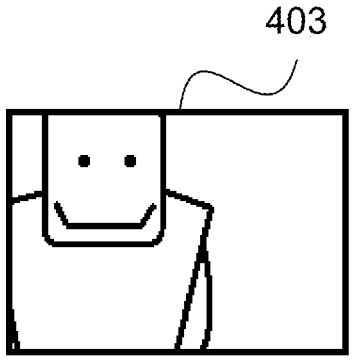


Fig. 4B

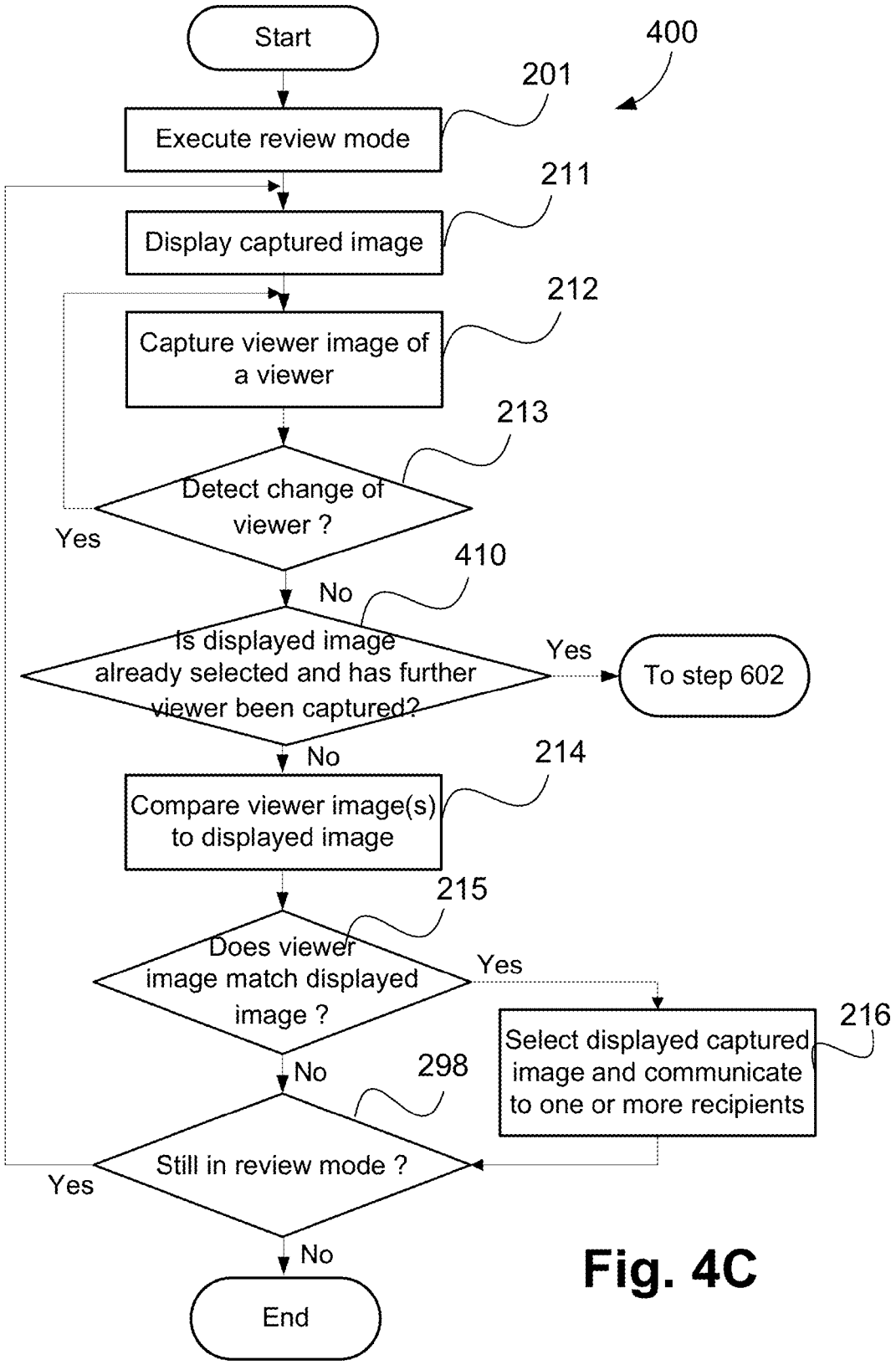

Start
400
201
Execute review mode
211
Display captured image
212
Capture viewer image of a viewer
213
Detect change of viewer ?
Yes
410
No
Is displayed image already selected and has further viewer been captured?
Yes
To step 602
No
214
Compare viewer image(s) to displayed image
215
Does viewer image match displayed image ?
Yes
216
Select displayed captured image and communicate to one or more recipients
No
298
Still in review mode ?
Yes
No
End

Fig. 4C

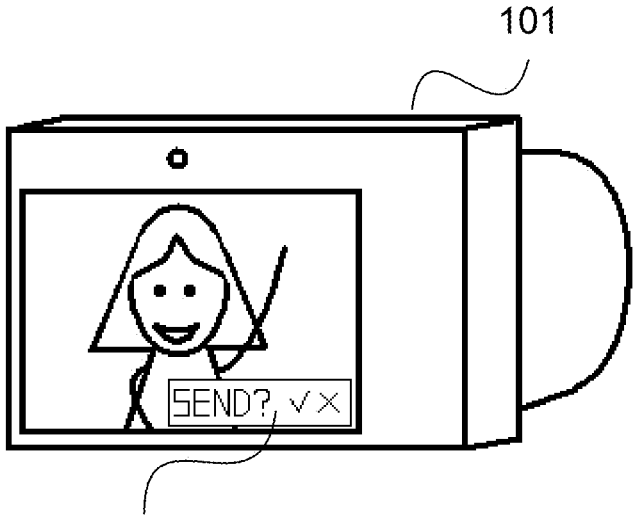


Fig. 5

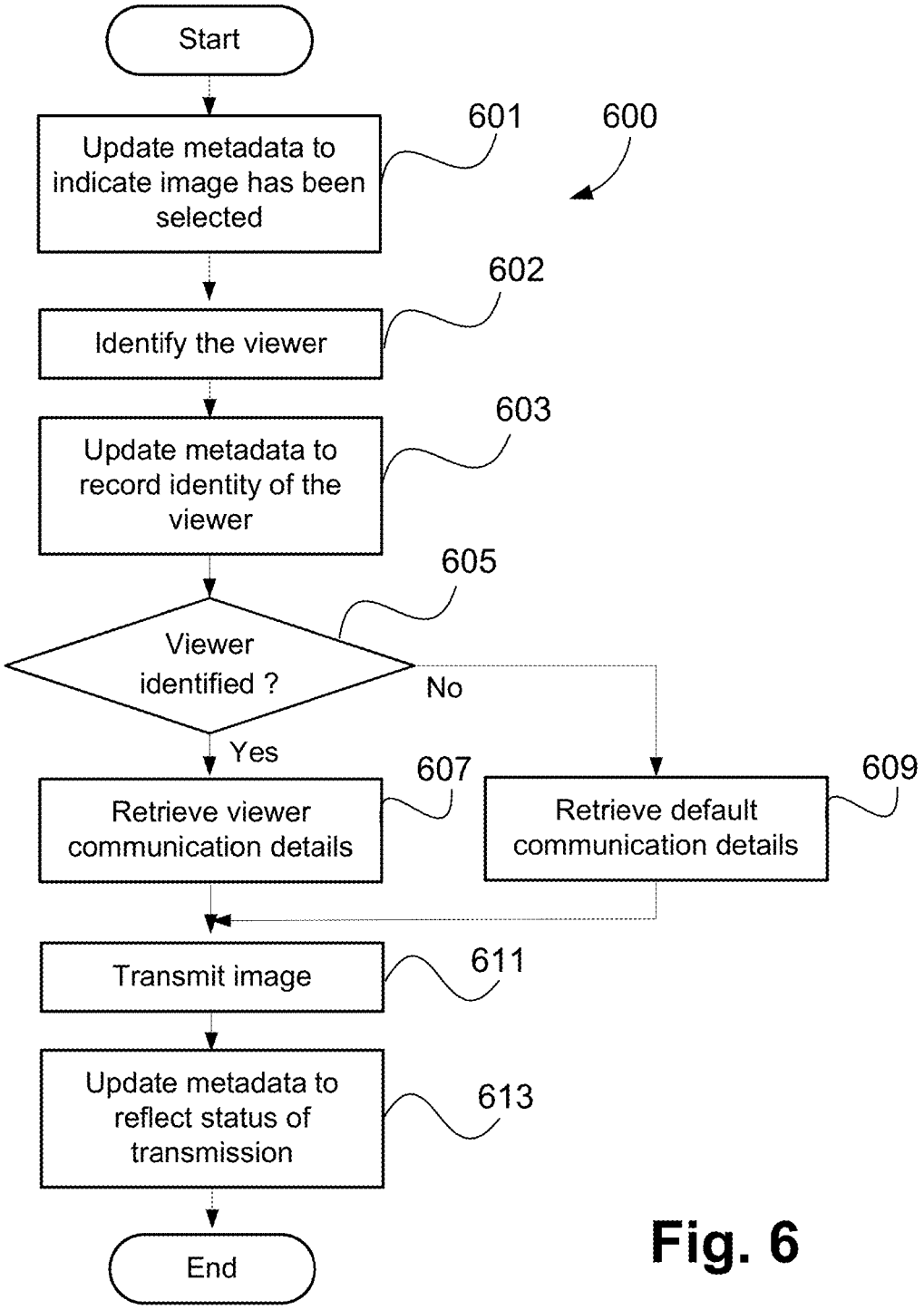

Start
Update metadata to indicate image has been selected
601
600
Identify the viewer
602
Update metadata to record identity of the viewer
603
Viewer identified ?
605
No
Yes
Retrieve viewer communication details
607
Retrieve default communication details
609
Transmit image
611
Update metadata to reflect status of transmission
613
End

Fig. 6

METHOD, SYSTEM AND APPARATUS FOR SELECTING AN IMAGE CAPTURED ON AN IMAGE CAPTURE DEVICE

REFERENCE TO RELATED PATENT APPLICATION(S)

This application claims the benefit under 35 U.S.C. §119 of the filing date of Australian Patent Application No. 2011253977, filed 12 Dec. 2011, hereby incorporated by reference in its entirety as if fully set forth herein.

FIELD OF INVENTION

The present invention relates to image capture devices such as digital cameras and, in particular, to timely sharing of an image with a recipient who appears in the image and has seen the image. The present invention also relates to a method, system and apparatus for selecting an image captured on an image capture device. The present invention also relates to a computer program product including a computer readable medium having recorded thereon a computer program for selecting an image captured on an image capture device.

DESCRIPTION OF BACKGROUND ART

Digital cameras enjoy widespread use today. Such devices use one or more sensors to capture light from a scene and convert the light to a digital image, commonly as JPEG or RAW format files, which can later be transferred to other devices. Many modern digital cameras allow captured images to be displayed on the device such that the photographer can review, show, edit or delete images without needing to develop film. This functionality is typically available after an image is captured and typically a photographer is able to view a captured image within less than one second after it is captured.

Modern digital camera technology is found in numerous portable devices including compact cameras, video camcorders, digital single-lens reflex (DSLR) cameras, mobile camera-phones, tablet computers, laptops and handheld videogame consoles. The portable nature and convenience of such devices allows a user to frequently carry some form of digital camera with them. Therefore there has been a notable increase in the number of images being captured. Additionally, the success of social networks and online photo-sharing services indicate that users enjoy having electronic access to images captured by their friends, especially if both parties co-attended the same event together.

In particular, one common social behavior between two parties—a photographer and a friend—is for the photographer to capture an image of the friend and subsequently show the friend the image using review functionality of the camera. It is often these images that the friend explicitly asks to be sent a copy of. One problem for the photographer in such a scenario is the lack of convenient functionality to pass the image to the friend. Typically the photographer would first return home, transfer images from the camera to a computer, and then transmit the digital files to the interested recipient via (for example) the Internet. However, such a method of sharing images takes place some considerable time after the moment of capture and review—and in some cases the photographer forgets to share the images—such that the friend does not receive their desired images for a long time.

A photographer with an online-enabled camera can address the above problem. For instance, the photographer can upload desired images to their public gallery where the friend can later view the uploaded images. However, this approach involves uploading the images to a public or semi-public location and does not fully preserve privacy.

Alternatively, the photographer can use their online-enabled camera to directly transmit the images to the recipient via an Internet service (e.g. email, social networks), a proximity protocol (e.g. infrared sensors, Bluetooth), or some other telecommunication services (e.g. MMS, or "smartphone" apps such as Bump™ by Bump Technologies and Dropbox™ by Dropbox Inc.). However, such methods require a user to manually input contact information about a recipient and this unnecessary labor is compounded if multiple friends wish to obtain the images.

One method of sharing images scans a disk for images, detects faces, recognises faces based on their digital facial signatures, and sends images to the recognised people. Drawbacks of such a method include the need for considerable amounts of training data (digital signatures) for identification. Further, an image may be sent to everyone identified rather than only users who ask for a copy.

SUMMARY OF THE INVENTION

It is an object of the present invention to substantially overcome, or at least ameliorate, one or more disadvantages of existing arrangements.

According to one aspect of the present disclosure there is provided a method of selecting an image captured on an image capture device, said method comprising:

displaying a captured image on a display associated with the image capture device;

capturing, using the image capture device, a viewer image of a viewer viewing the captured image displayed on the display;

comparing the captured image and the viewer image to identify at least one common feature in the captured image and the viewer image; and

selecting the captured image if the at least one common feature is identified in both the captured image and the viewer image.

According to another aspect of the present disclosure there is provided an apparatus for selecting an image captured on an image capture device, said apparatus comprising:

means for displaying a captured image on a display associated with the image capture device;

means for capturing, using the image capture device, a viewer image of a viewer viewing the captured image displayed on the display;

means for comparing the captured image and the viewer image to identify at least one common feature in the captured image and the viewer image; and

means for selecting the captured image if the at least one common feature is identified in both the captured image and the viewer image.

According to still another aspect of the present disclosure there is provided a system for selecting an image captured on an image capture device, said system comprising:

a memory for storing data and a computer program;

a processor coupled to said memory for executing said computer program, said computer program comprising instructions for:

displaying a captured image on a display associated with the image capture device;

capturing, using the image capture device, a viewer image of a viewer viewing the captured image displayed on the display;

comparing the captured image and the viewer image to identify at least one common feature in the captured image and the viewer image; and

selecting the captured image if the at least one common feature is identified in both the captured image and the viewer image.

According to still another aspect of the present disclosure there is provided a computer readable medium having a computer program stored thereon for selecting an image captured on an image capture device, said program comprising:

code for displaying a captured image on a display associated with the image capture device;

code for capturing, using the image capture device, a viewer image of a viewer viewing the captured image displayed on the display;

code for comparing the captured image and the viewer image to identify at least one common feature in the captured image and the viewer image; and

code for selecting the captured image if the at least one common feature is identified in both the captured image and the viewer image.

Other aspects of the invention are also disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described with reference to the following drawings, in which:

FIG. **1**A shows a system for capturing and selecting an image, including an image capture device;

FIGS. **1**B and **1**C collectively form a schematic block diagram representation of the image capture device of FIG. **1**A;

FIG. **2** is a schematic flow diagram showing a method of selecting an image;

FIG. **3**A shows the photographer of FIG. **1**A capturing an image of a friend using the camera of FIG. **1**A;

FIG. **3**B shows the friend of FIG. **3**A viewing the captured image on a display of the camera of FIG. **1**A;

FIG. **3**C shows an example of a captured image and a viewer image;

FIG. **4**A shows an example where a further viewer is shown the display of the camera of FIG. **1**A;

FIG. **4**B shows a further viewer image captured by the camera of FIG. **1**A;

FIG. **4**C is a schematic flow diagram of another method of selecting an image;

FIG. **5** shows a prompt displayed on a display of the camera of FIG. **1**A to prompt the photographer to confirm if transmission should be performed; and

FIG. **6** is a schematic flow diagram showing a method of communicating a selected image to one or more recipients.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Where reference is made in any one or more of the accompanying drawings to steps and/or features, which have the same reference numerals, those steps and/or features have for the purposes of this description the same function(s) or operation(s), unless the contrary intention appears.

A method **200** (see FIG. **2**) of selecting an image captured on an image capture device, such as a camera **101** (see FIG. **1**A), will be described below. The method **200** may be used for sharing images, especially digital photos, with interested parties who have seen the images on a display and have a strong association with the images.

In accordance with the method **200**, viewers of images are monitored while the images are being displayed. The method **200** also determines if the viewers are strongly associated with the images. Upon a successful match between a viewer and image content, contact details for the viewer are determined and the image may be electronically transmitted according to the contact details.

Sharing an image typically comprises providing access to the image to one or more interested parties (or recipients). The act of sharing generally refers to providing a copy, especially a digital copy of the image or access to a digital copy. A user typically shares a digital image by sending the recipient a file or hyperlink via a communication service. Examples of suitable communications services include Internet services (e.g. email, blogs, file hosting, social networks, TCP/UDP channels, etc.) or device-device communication technologies (e.g. Bluetooth™, infrared, WiFi, 2G, 3G, 4G, GSM, USB, Ethernet, etc.).

A photographer often physically shares (i.e. by displaying on the camera) an image with a subject if the image includes the subject. Often the subject then requests a copy of the image. The method **200** assists the photographer by automatically detecting the identity of the viewer and determining the contact details of the viewer. In particular, not every viewer of an image wishes to obtain a copy of every image. Therefore. the method **200** determines if there is a significantly strong association between the viewer and the image, such as if the viewer happens to be in the image. Upon successfully determining such an association, the image is selected for further processing and potential transmission. The further processing may comprise updating image metadata, obtaining communication details of the viewer, and transmitting images to the viewer. The method **200** therefore allows, for instance, a photographer to electronically share photos with co-present friends by letting the friends view the images on a display of the camera **101**.

FIGS. **1**B and **1**C collectively form a schematic block diagram of an image capture device in the form of the camera **101** including embedded components, upon which the method **200** to be described is desirably practiced. The camera **101** is a mobile camera-phone. Alternatively, the camera **101** may be in the form of a video camcorder, digital single-lens reflex (DSLR) camera, compact digital camera, or the like. Further, the camera **101** may be integrated within a surface computing device, a tablet computer, a laptop, a computer terminal, a handheld videogame console or the like. Still further, the method **200** to be described may also be performed on higher-level devices such as desktop computers, server computers, and other such devices with significantly larger processing resources.

As seen in FIG. **1**B, the camera **101** comprises an embedded controller **102**. Accordingly, the camera **101** may be referred to as an "embedded device." In the present example, the controller **102** has a processing unit (or processor) **105** which is bi-directionally coupled to an internal storage module **109**. The storage module **109** may be formed from non-volatile semiconductor read only memory (ROM) **160** and semiconductor random access memory (RAM) **170**, as seen in FIG. **1**C. The RAM **170** may be volatile, non-volatile or a combination of volatile and non-volatile memory.

The camera **101** includes a display controller **107**, which is connected to a video display **114**, such as a liquid crystal display (LCD) panel or the like. The display controller **107** is configured for displaying graphical images on the video display **114** in accordance with instructions received from the embedded controller **102**, to which the display controller **107** is connected.

The camera **101** also includes user input devices **113** which are typically formed by keys, a keypad or like controls. In some implementations, the user input devices **113** may include a touch sensitive panel physically associated with the display **114** to collectively form a touch-screen. Such a touch-screen may thus operate as one form of graphical user interface (GUI) as opposed to a prompt or menu driven GUI typically used with keypad-display combinations. Other forms of user input devices may also be used, such as a microphone (not illustrated) for voice commands or a joy-stick/thumb wheel (not illustrated) for ease of navigation about menus.

As seen in FIG. **1**B, the camera **101** also comprises a portable memory interface **106**, which is coupled to the processor **105** via a connection **119**. The portable memory interface **106** allows a complementary portable memory device **125** to be coupled to the camera **101** to act as a source or destination of data or to supplement the internal storage module **109**. Examples of such interfaces permit coupling with portable memory devices such as Universal Serial Bus (USB) memory devices, Secure Digital (SD) cards, CompactFlash (CF) cards, Personal Computer Memory Card International Association (PCMIA) cards, flash memory, optical disks and magnetic disks.

The camera **101** also has a communications interface **108** to permit coupling of the camera **101** to a computer or communications network **120** via a connection **121**. The connection **121** may be wired or wireless. For example, the connection **121** may be radio frequency or optical. An example of a wired connection includes Ethernet. Further, an example of wireless connection includes Bluetooth™ type local interconnection, Wi-Fi (including protocols based on the standards of the IEEE 802.11 family), Infrared Data Association (IrDa) and the like.

The embedded controller **102**, possibly in conjunction with further special function components **110**, is provided to perform functions of the camera **101**. The components **110** may represent a lens, focus control and image sensor of the camera **101**. The special function component **110** is connected to the embedded controller **102**. As another example, the camera **101** may be in the form of a mobile telephone handset. In this instance, the components **110** may comprise those components required for communications in a cellular telephone environment. Where the camera **101** is a portable device, the special function components **110** may also comprise a number of encoders and decoders of a type including Joint Photographic Experts Group (JPEG), (Moving Picture Experts Group) MPEG, MPEG-1 Audio Layer 3 (MP3), and the like.

The methods described hereinafter may be implemented using the embedded controller **102**, where the processes of FIGS. **2** to **6** may be implemented as one or more software application programs **133** executable within the embedded controller **102**. The camera **101** of FIG. **1**B implements the described methods. In particular, with reference to FIG. **1**C, the steps of the described methods are effected by instructions in the software **133** that are carried out within the controller **102**. The software instructions may be formed as one or more code modules, each for performing one or more particular tasks. The software may also be divided into two separate parts, in which a first part and the corresponding code modules performs the described methods and a second part and the corresponding code modules manage a user interface between the first part and the user.

The software **133** of the embedded controller **102** is typically stored in the non-volatile ROM **160** of the internal storage module **109**. The software **133** stored in the ROM **160** can be updated when required from a computer readable medium. The software **133** can be loaded into and executed by the processor **105**. In some instances, the processor **105** may execute software instructions that are located in RAM **170**. Software instructions may be loaded into the RAM **170** by the processor **105** initiating a copy of one or more code modules from ROM **160** into RAM **170**. Alternatively, the software instructions of one or more code modules may be pre-installed in a non-volatile region of RAM **170** by a manufacturer. After one or more code modules have been located in RAM **170**, the processor **105** may execute software instructions of the one or more code modules.

The application program **133** is typically pre-installed and stored in the ROM **160** by a manufacturer, prior to distribution of the camera **101**. However, in some instances, the application program **133** may be supplied to the user encoded on one or more CD-ROM (not shown) and read via the portable memory interface **106** of FIG. **1**B prior to storage in the internal storage module **109** or in the portable memory **125**. In another alternative, the software application program **133** may be read by the processor **105** from the network **120**, or loaded into the controller **102** or the portable storage medium **125** from other computer readable media. Computer readable storage media refers to any non-transitory tangible storage medium that participates in providing instructions and/or data to the controller **102** for execution and/or processing. Examples of such storage media include floppy disks, magnetic tape, CD-ROM, a hard disk drive, a ROM or integrated circuit, USB memory, a magneto-optical disk, flash memory, or a computer readable card such as a PCMCIA card and the like, whether or not such devices are internal or external of the camera **101**. Examples of transitory or non-tangible computer readable transmission media that may also participate in the provision of software, application programs, instructions and/or data to the camera **101** include radio or infra-red transmission channels as well as a network connection to another computer or networked device, and the Internet or Intranets including e-mail transmissions and information recorded on Websites and the like. A computer readable medium having such software or computer program recorded on it is a computer program product.

The second part of the application program **133** and the corresponding code modules mentioned above may be executed to implement one or more graphical user interfaces (GUIs) to be rendered or otherwise represented upon the display **114** of FIG. **1**B. Through manipulation of the user input device **113** (e.g., the keypad), a user of the camera **101** and the application program **133** may manipulate the interface in a functionally adaptable manner to provide controlling commands and/or input to the applications associated with the GUI(s). Other forms of functionally adaptable user interfaces may also be implemented, such as an audio interface utilizing speech prompts output via loudspeakers (not illustrated) and user voice commands input via the microphone (not illustrated).

FIG. **1**C illustrates in detail the embedded controller **102** having the processor **105** for executing the application program **133** and the internal storage **109**. The internal storage **109** comprises read only memory (ROM) **160** and random access memory (RAM) **170**. The processor **105** is able to execute the application program **133** stored in one or both of the connected memories **160** and **170**. When the camera **101** is initially powered up, a system program resident in the ROM **160** is executed. The application program **133** permanently stored in the ROM **160** is sometimes referred to as "firmware". Execution of the firmware by the processor **105** may

fulfil various functions, including processor management, memory management, device management, storage management and user interface.

The processor **105** typically includes a number of functional modules including a control unit (CU) **151**, an arithmetic logic unit (ALU) **152** and a local or internal memory comprising a set of registers **154** which typically contain atomic data elements **156**, **157**, along with internal buffer or cache memory **155**. One or more internal buses **159** interconnect these functional modules. The processor **105** typically also has one or more interfaces **158** for communicating with external devices via system bus **181**, using a connection **161**.

The application program **133** includes a sequence of instructions **162** though **163** that may include conditional branch and loop instructions. The program **133** may also include data, which is used in execution of the program **133**. This data may be stored as part of the instruction or in a separate location **164** within the ROM **160** or RAM **170**.

In general, the processor **105** is given a set of instructions, which are executed therein. This set of instructions may be organised into blocks, which perform specific tasks or handle specific events that occur in the camera **101**. Typically, the application program **133** waits for events and subsequently executes the block of code associated with that event. Events may be triggered in response to input from a user, via the user input devices **113** of FIG. **1**A, as detected by the processor **105**. Events may also be triggered in response to other sensors and interfaces in the camera **101**.

The execution of a set of the instructions may require numeric variables to be read and modified. Such numeric variables are stored in the RAM **170**. The disclosed method uses input variables **171** that are stored in known locations **172**, **173** in the memory **170**. The input variables **171** are processed to produce output variables **177** that are stored in known locations **178**, **179** in the memory **170**. Intermediate variables **174** may be stored in additional memory locations in locations **175**, **176** of the memory **170**. Alternatively, some intermediate variables may only exist in the registers **154** of the processor **105**.

The execution of a sequence of instructions is achieved in the processor **105** by repeated application of a fetch-execute cycle. The control unit **151** of the processor **105** maintains a register called the program counter, which contains the address in ROM **160** or RAM **170** of the next instruction to be executed. At the start of the fetch execute cycle, the contents of the memory address indexed by the program counter is loaded into the control unit **151**. The instruction thus loaded controls the subsequent operation of the processor **105**, causing for example, data to be loaded from ROM memory **160** into processor registers **154**, the contents of a register to be arithmetically combined with the contents of another register, the contents of a register to be written to the location stored in another register and so on. At the end of the fetch execute cycle the program counter is updated to point to the next instruction in the system program code. Depending on the instruction just executed this may involve incrementing the address contained in the program counter or loading the program counter with a new address in order to achieve a branch operation.

Each step or sub-process in the processes of the methods described below is associated with one or more segments of the application program **133**, and is performed by repeated execution of a fetch-execute cycle in the processor **105** or similar programmatic operation of other independent processor blocks in the camera **101**.

In one arrangement, the camera **101** displays one image in "review" mode while capturing a separate image of one or more viewers of the display **114**. The method **200** subsequently compares the images to algorithmically determine if the images share at least one common feature. However, there are multiple alternative arrangements of the camera **101** and the method **200**.

As seen in FIG. **1**A, a user **191** uses the camera **101** capable of displaying images. Viewers **192** and **193** are potentially able to view the display **114** of the camera **101**. For the purposes of identifying the viewers **192** and **193** and obtaining communication details (contact details) in order to transmit images, the camera **101** may comprise a local database **194** containing viewer details configured, for example, within the storage module **109**. Alternatively, the viewer details may be obtained using the processor **105**, via the communications network, **120** from an external data source **196** connected to the network **120**, such as from a social network.

With reference to FIG. **2**, the method **200** will be described by way of example where an image captured by the photographer **191** using the camera **101**, referred to as the "captured image", is being reviewed. The captured image is compared to an image of the viewer **192**, referred to as "viewer image". As an example, FIG. **3**C shows a captured image **300** and a viewer image **303** that may be compared. FIG. **3**A shows the photographer **191** capturing the image **300** using the camera **101**. The comparison determines if the viewer **192** is strongly associated with the captured image **300**. In some arrangements, especially those relating to digital photography, the comparison may be in relation to determining if the viewer **192** is looking at an image **300** of themselves. There may be multiple people (e.g., the viewer **192** and **193**) captured in the captured image **300** such that the viewer **192** is still identified to have a strong association with the captured image **300**.

In some arrangements, a common feature used to determine if the viewer **192** is strongly associated with the captured image **300** may be that of viewer ownership. For example, if the captured image **300** is of a dog or house owned by the viewer **192**, then there still exists a strong association between the viewer **192** and the captured image **300**.

The method **200** may be implemented as one or more software code modules of the software application program **133** resident within the storage module **109** and being controlled in its execution by the processor **105**.

The method **200** begins at review mode step **201**, where the processor **105** is used to execute a "review mode" using the display **114**, where one or more images, including the captured image **300**, may be displayed on the display **114** for review. As an example, the photographer **190** may switch the camera **101** to review mode using the input device **113**.

At display step **211**, the processor **105** is used for displaying the captured image **300**, and one or more other images stored in the storage module **109**, on the display **114** associated with the camera **101**, one image at a time. For example, FIG. **3**B shows the viewer **192** viewing the image **300** displayed on the display **114** of the camera **101**. In one arrangement, multiple images may be displayed on the display **114** at a time.

As the viewer **192** is viewing the display **114**, at capture step **212**, the processor **105** is used for capturing an image **303** of the viewer **192** (i.e., the "viewer image") viewing the captured image **300** displayed on the display **114**. The viewer image **303** may be stored within the storage module **109** using the processor **105**. The viewer image **303** may be significantly compact in terms of resolution and colour since quality of the viewer image **303** is not critical.

In one arrangement, the camera **101** comprises a small user-facing camera component **301**, as seen in FIG. **3**B, which may be configured for capturing the viewer image **303**

as the viewer **192** is viewing the image **300** displayed on the display **114**. Such a user-facing component **301** may alternatively be integrated within the surface computing device, the tablet computer, the laptop, the computer terminal, the handheld videogame console or the like, as described above. In another arrangement, the display **114** and camera used to capture the viewer image **303** may be separate hardware components. For example, the viewer image **303** may be captured at step **212** using a webcam connected to the network **120**. Such a webcam may, for example, capture an image of the viewer **192** during a video phone call.

Additionally, in some arrangements the capture step **212** may be initiated by a user input, such as a designated button, gesture, voice command, or the like. However, in other arrangements the capture step **212** is performed passively such that one or more viewer images **303** are automatically captured when a viewer **192** is near the display **114**. At detection step **213**, the processor **105** is used for detecting if a change of viewer occurs, such as the second viewer **193** approaching the camera **101**. If the processor **105** detects a change of viewer at step **213**, then the method **200** returns to step **212**. In this instance, at step **212**, the processor **105** is used for capturing additional viewer images showing, for example, the further viewer **193**. Otherwise, the method **200** proceeds to step **214**. For example, FIG. **4**A shows an example where the further viewer **193** appears and is also shown the display **114** of the camera **101**. In accordance with the example of FIG. **4**A, a viewer image **403** depicting the further viewer **193**, as shown in FIG. **4**B, is captured at step **212**. In one arrangement, the user-facing camera component **301** may be used to capture the viewer image **403** as the viewer **193** is viewing the image **300** displayed on the display **114**. In another arrangement, the viewer image **403** may be captured using a webcam or the like connected to the network **120**.

In accordance with the present example, once at least one image (e.g., the viewer image **303**) of at least the viewer **192** is captured, at comparison step **214**, the processor **105** is used for comparing the image(s) (e.g., the captured image **300**) being displayed on the display **114** and the viewer image **303** to identify at least one common feature in both the captured image and the viewer image **303**. In accordance with one example, in the event that the viewer image **403** has been captured, the processor **105** may also be used to perform a comparison between the viewer image **403** and image(s) being displayed on the display **114**, including the captured image **300**.

At matching step **215**, if the processor **105** determines that there is a match between the viewer image **303** and the displayed captured image **300** (e.g., at least one common feature has been identified in the viewer image **303** and the captured image **300** at step **214**), or any of the other images displayed on the display **114** at step **211**, then the method **200** proceeds to selecting step **216**. Otherwise, the method **200** proceeds to step **298**. In accordance with some arrangements, step **215** may impose additional conditions to be satisfied along with the matching of the viewer image **303** and the displayed captured image **300**. For example, an additional condition is that the captured image **300** is displayed or viewed for a minimum time interval. The minimum time interval may be configured to be long enough to ensure that a viewer, such as the viewer **192**, is actively looking at the captured image **300** and not merely flicking through images. The minimum time interval may also be configured to be long enough to ensure that the viewer **192** has time to react to changes in the display **114**. As such, the processor **105** may be configured to determine if the captured image has been viewed for the minimum time interval before the method **200** proceeds to step **216**.

In a second example, an additional condition is that a positive or negative emotional response is detected in a viewer, such as the viewer **192**. A typical positive response may be a smile, detectable using either the viewer image **303** or the user-facing camera component **301**. Another example of a positive response is laughter, detectable by a user input component **113** such as a microphone. Once any additional conditions are satisfied and a match is confirmed at step **215**, the method **200** proceeds to step **216**. As such, the processor **105** may be configured for detecting the positive or negative emotional response from the viewer **192** before the method **200** proceeds to step **216**. In this instance, as described below, the displayed captured image may be transmitted following such a positive emotional response being detected from the viewer **192**.

At selecting step **216**, the processor **105** is used for selecting the displayed captured image **300**, displayed on the display **114**, and communicating the captured image **300** to one or more recipients. A method **600** of communicating the selected image **300** to one or more recipients, as executed at step **216**, will be described in detail below with reference to FIG. **6**. As described above, the captured image **300** is selected if at least one common feature is identified in both the captured image **300** and the viewer image **303**.

At decision step **298**, the processor **105** is used to determine if the camera **101** is still in review mode. If the camera **101** is still in review mode, then the method **200** returns to steps **211** and **212** and the camera **101** waits for either a new viewer image to be captured or the display **114** to change to display a new image. Otherwise, the method **200** concludes.

In accordance with the example of FIG. **3**B, the viewer image **303** captured using the camera component **301** is compared to the image **300** at step **214**. In one arrangement, at comparison step **214**, the processor **105** is used to determine visual similarity of facial features in the captured image **300** (and other images) displayed on the display **114** and the viewer image **303**. Accordingly, the common feature identified in the viewer image **303** and the captured image **300** may be a human face. Face detection methods may be used to determine regions of the displayed image **300** and viewer image **303** perceived to be of a face. Any face detection method suitable for implementing with still images or video frames may be used at step **214**. Facial regions determined using such face detection methods may then be compared to each other for visual similarity using, depending on hardware limitations, one or a combination of similarity metrics such as mean squares, cross-correlation, ratio image uniformity, pattern intensity, mutual information or the like. If similarity determined between the facial regions of the images **300** and **303**, exceeds a predetermined threshold, for example, then facial regions are determined to be equal. Such face detection and comparison methods do not require a face to be positively identified.

As another example, at comparison step **214**, the processor **105** may be used to determine similarity between other body parts or features displayed within the images **300** and **303**, such as a distinctive hairstyle, presence of clothing apparel such as a hat or umbrella, or wearable patterns such as a personal identifier (e.g., name-tag), a barcode and/or a t-shirt design, shown in the captured image (and other images) displayed on the display **114** and the viewer image.

For the example captured image **300** and the viewer image **303**, key common features between both images **300** and **303** may be likeness of the viewer **192** in the images **300** and **303**, particularly the face and clothing of the viewer **192**. For

example, the common feature identified in the captured image **300** and the viewer image **303** may be one or more of shape, material, texture or colour of a dress or clothing apparel being worn by the viewer **192**. In this instance, if similarity between the common features of the images **300** and **303** exceeds a predefined minimum threshold at step **214**, then the image **300** is selected for communication at step **216**.

In one arrangement, a database of features associated with known viewers, may be used at step **214**. For example, the database of features may be configured within the storage module **109** together with the local database containing viewer details. Alternatively, such a database of features may be obtained using the processor **105**, via the communications network **120**, from an external data source **196** connected to the network **120**. In this instance, the processor **105** may determine if the viewer image **303** and displayed captured image **300** contain common features in the form of objects that belong to the viewer **192**, such as a pet, car or house.

Additionally, in some arrangements, the aforementioned criteria, including facial recognition, similarity of other body parts or features and/or similarity of objects that belong to the viewer **192**, may be used in combination to determine similarity between the captured image **300** (and other images) displayed on the display **114** and the viewer image **303**. A combination of such criteria provides additional support and strengthens confidence of the determination of a match between the displayed captured image **300** and the viewer image **303**.

The method **600** of communicating the selected image **300** to one or more recipients, as executed at step **216**, will now be described with reference to FIG. **6**. The method **600** may implemented as one or more code modules of the software application program **133**, resident in the storage module **109**, and being controlled in its execution by the processor **105**. Alternatively, the method **600** may be performed using external means, such as on a personal computer (PC) connected to the network **120**. In one arrangement, the method **600** may be performed on a remote server or the like (e.g., executing a cloud computing service), where computational resources are more abundant.

The method **600** begins at step **601**, where the processor **105** is used for updating the image metadata associated with the selected image **300** to indicate that the image **300** has been selected. The metadata may be in the form of EXIF, ICMP, XMP or alternative formats and once updated the metadata may be stored with the selected image **300** within the storage module **109**.

At identification step **602**, the processor **105** is used to identify the viewer **192**. In one arrangement, the viewer **192** may be identified by performing facial recognition on one or both the viewer image **303** and the selected image **300**. Any face recognition method suitable for implementing with still images or video frames may be used at step **602**, in a similar manner to step **214** above.

Then at updating step **603**, metadata associated with the selected image **300** is updated to indicate the identity of the viewer **192**. The metadata updated at step **603** may be stored with the selected image **300** within the storage module **109**.

At decision step **605**, the processor **205** is used to determine if the viewer **192** has been identified. If the viewer **192** has been identified, then the method **600** proceeds to step **607**. Otherwise, the method **600** proceeds to step **609**. In one arrangement, the method **600** may conclude following step **605**, if the viewer **192** is not identified, and step **298** of the method **200** is performed as seen in FIG. **2**.

At step **607**, the processor **105** is used for retrieving communication details for the viewer **192** identified at step **602**. The communication details may be in the form of a destination address or resource where the selected image **300** should be communicated. The destination address may be an email address for an email account, a social network identifier, a telephone number, a postal address, a social security number, a username, a nickname, a blog address, a web address, or various similar identifiers that are associated with the viewer **192**. In one arrangement, communication details for one or more other recipients, such as the photographer **191** and/or further viewers **193**, may also be retrieved at step **607**.

In one arrangement, the destination address or resource retrieved at step **607** may be associated with and accessible to the viewer **192** but not belong exclusively to the viewer **192**. For example, the address or resource may identify an online public photo gallery.

As described above, the communication details may be retrieved at step **607** based on the identity of the viewer **192** as determined at step **602**. For example, a metadata tag may be determined at step **602**. In this instance, at step **607**, the processor **105** may be used to match the metadata tag determined at step **602** to a metadata tag stored in the local database **194** of communication details configured within the storage module **109**. Alternatively, such a database of communication details may be configured within a remote database (e.g., within the data source **196**) accessed via the network **120**.

The data source **196** may be associated with a social networking site or the like. In this instance, the processor **105** may be used to access one or more social networking pages associated with the viewer **192** (e.g., using the metadata tag) to retrieve the communication details of the viewer **192**.

As described above, if the viewer **192** is not identified at step **605**, then in some arrangements the method **600** may proceed to step **609**. At step **609**, the processor **105** is used to retrieve default communication details. For example, a default destination address or resource may be retrieved at step **609** for the communication of the selected image **300**. For example, the default destination address may be the address of a personal blog or social network gallery associated with the photographer **191** where the viewers **192** and **193** may access the images online.

At communication step **611**, the processor **105** is used to communicate the selected image **300** to the viewer **192** based on the communication details retrieved at step **607** or at step **609**. For example, the selected image **300** may be transmitted via the network **120** to a remote email server connected to the network **120**, based on an email address retrieved at step **606**. In one arrangement, the selected image **300** may be transmitted at step **611** to a plurality of recipients including, for example, the photographer **191**, the viewer **192**, and/or further viewers **193**. In this instance, as well as retrieving the communication details for the viewer **192** at step **607**, the communication details for the photographer **191** and/or any further viewers **193** may also be retrieved.

Prior to transmission, the selected image **300** may be queued for transmission, for example, within the storage module **109**.

In one arrangement, the processor **105** may be used for flagging the selected image **300** for pending transmission at step **611** rather than transmitting the image immediately. The selected image **300** may be flagged in such a manner for example, if the camera **101** lacks access to the communication network **120** at the time that the selected image **300** is selected at step **216**. In one arrangement, the selected image **300** may be flagged in such a manner if a resource cost associated with transmitting the image over the network **120** may be more expensive than a different network that is tem-

porarily out of range. In one arrangement, the selected image **300** may be flagged in such a manner if the user prefers to explicitly confirm which data is sent from the camera **101** and at what time it is transmitted.

At updating step **613**, the processor **105** is used to update the metadata associated with the selected image **300** to reflect status of the transmission. The metadata updated at step **613** may be stored with the selected image **300** within the storage module **109**.

In addition to the selected image **300**, the processor **105** may be used at step **216** for selecting additional images, associated with the selected image **300**, for transmission. For example, images that were contemporaneously captured to the first selected image **300** may also be of interest to the viewer **192** and may be bundled together with the first selected image **300**. In one arrangement, such additional selected images may depict a common feature (e.g., facial or other body part feature, object belonging to the viewer **300**) that resulted in a successful match at step **214** of the first selected image **300** with the viewer image **303**, although such a common feature is not necessary once at least the image **300** has been successfully selected. One of the additional selected images may be transmitted to one or more recipients if the additional selected image has at least one common feature with the viewer image **303**. If such additional images are selected, then at step **601**, the processor **105** may be used for updating metadata associated with the additional images.

FIG. **4**C shows another method **400** of selecting an image. The method **400** may be implemented as one or more code modules of the software application program **133** resident on the hard disk drive and being controlled in its execution by the processor **105**. The method **400** supports transmission of the captured image **300** to recipients other than the viewer **192**, such as a further viewer **193**.

The method **400** is similar to the method **200** and includes steps **201** and **211**, **212** and **213**, **214**, **215**, **216** and **298**. However, at step **410**, the processor **105** is used to determine if the displayed image **300** is already selected and if a further viewer image (e.g., the viewer image **403**) has been captured. If the displayed image **300** is already selected and if a further viewer image has been captured, then the method **400** bypasses the comparison steps **214** and proceeds directly to step **602** to identify the further viewer **193** and obtain communication details for the further viewer **193**. In this instance, at step **602**, the processor **105** is used to identify the further viewer **193** by, for example, performing facial recognition on the further viewer image **403**. Then at updating step **603**, the processor **105** is used to update the metadata associated with the selected image **300** in order to indicate the identity of the further viewer **193**. Again, the metadata may be stored with the selected image **300** within the storage module **109**.

Then at decision step **605**, the processor **105** is used to determine if the further viewer **193** has been identified. If the viewer **193** has been identified, then the method **600** proceeds to step **607**, where the communication details of the further viewer **193** are retrieved. Then at step **611**, the processor **105** is used to communicate the selected image **300** to the viewer **193** based on the communication details retrieved at step **607**, as well as communicating the selected image **300** to the viewer **192** as described above. The method **600** allows an already-selected image **300** to be transmitted to other recipients who may not normally match the displayed image **300**.

If the displayed image **300** is not already selected at step **410**, then the method **400** proceeds to step **214** which is executed as described above.

In further arrangements, the viewer order may be reversed such that the further viewer **193** sees the image **300** on the display **114** first and subsequently fails to match the image **300** at step **214**. The first viewer **192** may then view the image **300** on the display **114** and be successfully matched with the image **300** at step **214**. As long as the viewer image **403** of the further viewer **193** is temporarily stored in memory (e.g., within RAM **170**), further arrangements may be used to transmit data to both viewers **192** and **193**, and to one or more other recipients.

FIG. **5** shows a prompt **500** that may be displayed on the display **114** in accordance with some arrangements. The prompt may be used for prompting the photographer **191** confirm or adjust transmission parameters associated with communicating the image **300**, for example, at step **611**. For example, the prompt **500** may display text asking the photographer **191** for confirmation or permission to transmit data (e.g., the image **300**) from the camera **101**. The photographer **191** may use the prompt **500** to optionally adjust the transmission parameters of the recipient(s) before the image(s) (e.g., **300**) are transmitted.

INDUSTRIAL APPLICABILITY

The arrangements described are applicable to the computer and data processing industries and particularly for the image processing.

The foregoing describes only some embodiments of the present invention, and modifications and/or changes can be made thereto without departing from the scope and spirit of the invention, the embodiments being illustrative and not restrictive.

In the context of this specification, the word "comprising" means "including principally but not necessarily solely" or "having" or "including", and not "consisting only of". Variations of the word "comprising", such as "comprise" and "comprises" have correspondingly varied meanings.

The claims defining the invention are as follows:

1. A method of selecting an image captured on a portable image capture device having a forward facing camera component and a backward facing camera component, said method comprising:

capturing an image using the forward facing camera component of the portable image capture device;

displaying the captured image on a display of the portable image capture device;

capturing, using the backward facing camera component of the portable image capture device, a viewer image of at least the viewer viewing the display displaying the displayed image;

comparing at least one region of the displayed image and the viewer image to identify at least one common feature in the displayed image and the viewer image; and

selecting the displayed image for communication to at least the viewer according to the communication details of the viewer, if the at least one common feature is identified in both the displayed image and the viewer image.

2. The method according to claim **1**, wherein the at least one common feature is a human face.

3. The method according to claim **1**, wherein the common feature is a personal identifier.

4. The method according to claim **1**, wherein the common feature is one or more of shape, material, texture or colour of a dress or clothing apparel of the viewer.

5. The method according to claim **1**, further comprising updating metadata associated with the selected image.

6. The method according to claim 1, further comprising determining if the displayed image has been viewed for a minimum time interval before the displayed image is selected.

7. The method according to claim 1, further comprising detecting a positive or negative emotional response from the viewer before the displayed image is selected.

8. The method according to claim 1, further comprising retrieving said communication details for the viewer using the identity of the viewer determined from the viewer image.

9. The method according to claim 1, further comprising flagging the selected image for pending transmission.

10. The method according to claim 1, further comprising prompting a user to confirm and/or adjust transmission parameters associated with communicating the selected image to one or more recipients.

11. The method according to claim 1, further comprising detecting a change of viewer.

12. The method according to claim 1, further comprising capturing an image of a further viewer.

13. The method according to claim 1, wherein the image capture device is a digital camera.

14. The method according to claim 1, wherein the image capture device is a camera-phone.

15. The method according to claim 1, wherein the image capture device is a surface computing device.

16. The method according to claim 1, wherein the image capture device is a computer terminal comprising a user-facing camera configured for capturing images of the viewer.

17. The method according to claim 1, where the display and camera are separate hardware components.

18. The method according to claim 1, wherein the communication details are retrieved from a social network using the identity of the viewer determined from the viewer image.

19. The method according to claim 1, further comprising transmitting the selected image to one or more recipients.

20. The method according to claim 19, wherein the selected image is transmitted following a positive emotional response being detected from the viewer.

21. The method according to claim 19, wherein the communication details are retrieved from a social network.

22. The method according to claim 1, further comprising selecting additional images associated with the selected image.

23. The method according to claim 22, further comprising updating metadata associated with the additional images.

24. The method according to claim 22, further comprising transmitting one or more of the additional selected images to one or more recipients.

25. The method according to claim 22, wherein one of the additional selected images is transmitted to one or more recipients if the additional selected image has at least one common feature with the viewer image.

26. Apparatus for selecting an image captured on a portable image capture device having a forward facing camera component and a backward facing camera component, said apparatus comprising:

means for capturing an image using the forward facing camera component of the portable image capture device;

means for displaying the captured image on a display of the portable image capture device;

means for capturing, using the backward facing camera component of the portable image capture device, a viewer image of at least the viewer viewing the display displaying the displayed image;

means for comparing at least one region of the displayed image and the viewer image to identify at least one common feature in the displayed image and the viewer image; and

means for selecting the displayed image for communication to at least the viewer according to the communication details of the viewer, if the at least one common feature is identified in both the displayed image and the viewer image.

27. A system for selecting an image captured on a portable image capture device having a forward facing camera component and a backward facing camera component, said system comprising:

a memory for storing data and a computer program;

a processor coupled to said memory for executing said computer program, said computer program comprising instructions for:

capturing an image using the forward facing camera component of the portable image capture device;

displaying the captured image on a display of the portable image capture device;

capturing, using the backward facing camera component of the portable image capture device, a viewer image of at least the viewer viewing the display displaying the displayed image;

comparing at least one region of the displayed image and the viewer image to identify at least one common feature in the displayed image and the viewer image; and

selecting the displayed image for communicating to at least the viewer according to the communication details of the viewer, if the at least one common feature is identified in both the displayed image and the viewer image.

28. A non-transitory computer readable medium having a computer program stored thereon for selecting an image captured on a portable image capture device having a forward facing camera component and a backward facing camera component, said program comprising:

code for capturing an image using the forward facing camera component of the portable image capture device;

code for displaying the captured image on a display of the portable image capture device;

code for capturing, using the backward facing camera component of the portable image capture device, a viewer image of at least the viewer viewing the display displaying the displayed image;

code for comparing at least one region of the displayed image and the viewer image to identify at least one common feature in the displayed image and the viewer image; and

code for selecting the displayed image for communication to at least the viewer according to the communication details of the viewer, if the at least one common feature is identified in both the displayed image and the viewer image.

29. A method of selecting an image captured on an image capture device having at least two lens components integral with the image capture device, said method comprising:

capturing an image on an image capture device using a first lens component of the image capture device, the image capture device being adapted to operate in a capture mode to capture images to be displayed on a display of the image capture device, in a review mode to display the images captured in the capture mode on the display of the image capture device, and in a viewer image capture

mode to capture at least one image of a viewer using a second lens component while the viewer is reviewing the displayed image;

displaying the captured image on the display of the image capture device if the image capture device is in the review mode;

capturing, using the second lens component of the image capture device being in the viewer image capture mode, an image of a viewer viewing the display displaying the displayed image, in response to detecting the viewer;

comparing at least one region of the displayed image and the viewer image to identify at least one common feature in the displayed image and the viewer image; and

selecting the displayed image for communication to at least the viewer according to communication details of the viewer, if the common feature is identified in both the displayed image and the viewer image, wherein the communication details of the viewer are retrieved from a database using the identity of the viewer detected based on the viewer image.

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